

Design and Technology

Materials from nature

Learning objectives

- The students learn how we have designed things by taking ideas from nature. They also learn how to describe natural and man-made materials.
- In the project stage, they use this information to design a material or product based on something in the natural world.

Useful vocabulary

be made of develop float gecko glue lotus
seeds shark smooth Velcro

Preparation

If the students are going to do the project in class, they will either need access to the internet or books. You could bring in to class some of the materials like glue and Velcro.

Warmer

Play *Animal, vegetable or mineral?* (a mineral means an object in this game). You think of something and the students must ask you yes/no questions to find out what you are. For example:

Student 1: Are you an animal?

Teacher: No.

Student 2: Are you made of wood?

Teacher: No.

Student 3: Can we see you in this room?

Teacher: Yes.

Student 4: Are you made of glass?

Teacher: Yes.

Student 5: Do we look through you?

Teacher: Yes.

Student 6: Are you a window?

Teacher: Yes!

Demonstrate, then arrange the students into pairs to play themselves.

- 1 The world around us has inspired a lot of designs and inventions. Birds/airplanes is the most obvious example. Tell the students to make a paper airplane and throw it around. Alternatively just do this yourself. Ask the students if the shape is similar to anything they know in nature (a bird). Ask if there are any other objects similar to things in nature. Give some examples: a knife is like a claw (explain *claw*); a swimming pool is like a lake; a straw is like an elephant's trunk (explain *straw* and *trunk*). If students are having difficulty coming up with ideas, give them clues and see if they can guess where

the idea for these things came from. For example, for 'trunk', *What do elephants do with their trunk?* (eat and drink) *Is there anything like this we use for drinking?* (a straw)

Sample answers

The front of bullet trains in Japan were modelled on the beak of a kingfisher (bird); wind turbine blades were modelled on humpback whale flippers to reduce noise and drag; torpedos missles 'swim' like tuna fish; some ice picks were designed after looking at how woodpeckers drill into wood; radar and sonar technology were inspired by bats.

- 2 Draw a Mexican hat as seen from above (like a small circle within a big circle) and ask the students what it is. They then match the pictures and the close-ups and say what part of the animal or plant the close-up is.

Get the students to try and predict what scientists might develop from each animal or thing. Give some clues, for example *Do you think lotus leaves float?* (yes) *What else floats?* (boats)

Extension activity

The students could use the cameras on their mobile devices to take close-up photos of objects around the room for the other students to guess. If they don't have cameras, they could just draw.

- 3 Give the students two minutes to read the text and check their answers.

Fast finishers

The students write down five more compounds (noun + noun) with the names of animals and plants, for example *mouse pad*, *tree house*, *horse ride*, *rose garden*, *bird table*.

Answers

- 1 b – close-up of hairs on a gecko's foot
- 2 c – close-up of a lotus leaf
- 3 d – close-up of a shark's skin
- 4 a – close-up of a seed head

- 4 Arrange the students into groups of four. Give each student one part of the text to read. Ask them to find out what material their animal or plant gave us and make notes on the chart.

Answers

1b: superstrong and sticky glue,

2c: smooth self-cleaning surface of e.g. snowboards, roofs and wind turbines,

3d: material for superfast swimsuits and the bottom of boats,

4a: Velcro.

	a	b	c	d
Name of animal or plant:	gecko	lotus plant	sharks	burdock plant
Which part of the animal/plant the design idea came from:	hairs on its feet	leaves	skin	seeds
The new material:	super-strong and sticky glue	smooth, water resistant materials	super-fast material in water	Velcro
Examples of its use:	stick TVs onto walls, repair planes	on the surface of wind turbines, roofs and snowboards	swimsuits; the bottom of boats	fastening shoes

Extension activity

The students think of three unusual or funny things they could use super-strong glue for. Give some examples: to close the mouths of people who talk a lot; to keep people on the ground in a hurricane; to put on your hands and feet and climb over castle walls.

- 5 The students use their notes to tell one another about the material they read about. The other students could fill in the rest of their chart as they listen.

Ask some questions about the different parts of the text to check understanding, for example, *Can you use strong glue in the sea?* (yes) *Why doesn't the water stay on lotus leaves?* (They have a very smooth surface.) *What is special about a shark's skin?* (It has things that look like little teeth. They have lines on them that make water flow fast over them.) *How many years ago was Velcro invented?* (over 60 years ago)

Afterwards, they should discuss together the most interesting material and the most useful idea.

Extension activity

The students think of three more things that 'it's difficult to imagine the world without'. Give the obvious examples like the internet and computers so the students can think of something more interesting to discuss and compare, like medicine, school and the Olympics.

Subject learning

In the next stage, the students are going to create a new material or product from something in nature. Get the students to tell you the examples they have already learned about in the lesson, what the material/product is and what gave the idea. Give them more words and phrases for talking about materials and design, for example, *it's like ...*, *the idea comes from ...*, *leather*, *plastic*, *stone*, *wood*.

Project

- Arrange the students into small groups to choose a topic and discuss the questions. Go through an example with the whole class.
 - I'm interested in clothes and fashion. What do you think about in nature?*
 - How about those animals that change their skin colour in different seasons?*
 - Can you give me any examples?*
 - What's that animal like a dog, it goes white in the winter?*
 - A fox?*
 - Yes.*
 - What do they change colour for?*
 - So other animals won't see them in the snow.*
 - Could we make something like that?*
 - Well, it would be nice to have a top which changes colour.*
 - Why?*
 - etc.*
- The students then create a new material or product from nature for this topic.
- They give a mini-presentation to the class using the model given. They could make a poster with a short text and a picture or diagram.
- The class decides which is the most interesting and useful material or product.
- As an extension, they could make an advert for their material or product, saying why it is so useful and why people should buy it.

Cooler

Ask the students to find the odd-one-out in these lists and say why. There could be many different answers.

lion – monkey – gecko – bird (*lion* because it can't get up a tree)

glue – Velcro – sellotape – string (*glue* because it is liquid)

shark – snake – bear – duck (*bear* because it sleeps in winter)

plane – train – boat – bicycle (*bicycle* because I have one)

eye – hair – nose – hand (*hair* because it keeps you warm)

snowboarding – tennis – ice-hockey – boxing (*snowboarding* because one person can do this alone)